

Remarks

In paragraph 3 of the Examiner's Office Action, the Examiner objected to Claims 1, 6, 7, 9 and 15-19 "because of the following informalities: though alternative expressions are permissive in claims, they should be drafted in proper alternative format, i.e., '**selected from A, B or C**'; or in proper Markush claim format, i.e., '**selected from the group consisting of A, B and C.**'" Applicants have amended Claims 1, 6, 7, 9 and 15-19, using the proper Markush claim format.

In paragraph 4 of the Examiner's Office Action, the Examiner objected to Claim 9 because Claim 9 "recites the limitation 'coated with one or more metallic layers, an alloy selected from the group consisting of brass, bronze, zinc, zinc alloy, tin or tin alloy' however as recited, it appears as if the coating can be of any metallic layer or an alloy recited as opposed to a metallic layer consisting of or comprising the alloys cited." Applicants have amended Claim 9 to reflect that the coating can be of any metallic layer comprising the alloys cited.

In paragraph 5 of the Examiner's Office Action, the Examiner objected to Claim 19 because "at line 16, the term 'is' in the phrase 'an acrylic or methacrylic acid group and is methyl or ethyl esters' should probably be 'its.'" Applicants have amended Claim 19 accordingly.

In paragraph 7 of the Examiner's Office Action, the Examiner rejected Claims 17 and 19 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention." In particular, the Examiner determined that, with respect to Claim 17, the original disclosure at the time of filing does not provide support for a polymer bearing functional groups covalently bound to the metal surface wherein the polymer includes **all** of the functional groups and epoxy groups as claimed. Based on the description at pages 8-9 of the patent specification, the Examiner believes that the claim should probably read the claimed functional groups in the alternative form. Applicants have amended Claim 17 accordingly, to indicate that the functional group "is selected from" the groups claimed in the alternative therein.

Similarly, the Examiner rejected Claim 19 because it states "wherein the general formula (I) are as follows", followed by a list of functional groups wherein the list is not recited in alternative format and "hence appears to be directed to a formula wherein all of these functional

groups are present. Applicants have amended Claim 19 to list the functional groups therein in the alternative format.

Thus, Applicant respectfully submits that the Examiner's rejections under 35 U.S.C. § 112, first paragraph, have been overcome.

The Examiner also rejected Claim 16 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. More particularly, the Examiner noted that there is insufficient antecedent basis in the claim limitation: "according to Claim 12, wherein the non-cured rubber composition is selected from." Applicant has amended Claim 16 such that it depends from Claim 15, which claims an elastomeriblock copolymer selected from a group including a functionalized non-cured rubber composition," thus providing an antecedent basis for the limitation of Claim 16 cited by the Examiner.

The Examiner also rejected Claim 18 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner, in particular, states that there is insufficient antecedent basis for the limitation "prepolymer of the coating" in the claim, "given that Claim 1 is directed to a polymer only." Applicants have addressed the Examiner's rejection by amending Claim 18 to omit the limitation of a "prepolymer of the coating."

The Examiner rejected Claim 19 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that Claim 19 recites: "according to Claim 18, wherein the general formula (I) are as follows . . ." followed by three lists of various chemical groups for X, Y and R that are not presented in alternative format. The Examiner further states that there is only one general formula (I) in Claim 18, "it is unclear whether the Applicant is attempting to claim a general formula (I) . . . or multiple formulas given the term 'are as follows.'" Applicants have addressed the Examiner's rejection by amending Claim 19 to claim only one general formula (I).

The Examiner also rejected claims 1-8, 11-12, 15, 18 and 20-21 under 35 U.S.C. § 102(e) as being anticipated by Garnier et al. ("Garnier"). Garnier discloses a process whereby the "adhesive substance is dissolved in an organic solvent and the metallic reinforcing carrier is drawn through this solution (dipping process)." See Garnier at col. 3, lines 56-60. In contrast,

Applicant has amended Claims 1, 6 and 7 to clarify that these claims (in addition to Claim 11) claim the deposit of an adhesion promoter from **solution** (as opposed to a more viscous liquid polymer), thereby allowing the layer to be deposited as a solution (i.e., by painting) upon the metallic surface (as opposed to dipping). A layer deposited from solution results in a thinner layer than that achieved by dipping and also results in stronger boundary layers, which is an advantageous mechanical property. Moreover, unlike Garnier, Applicant's invention concerns the deposit of a coating on the metallic surface **and a polymer** co-polymerizable with the polymeric or elastomeric material. This presence of the polymer already in the coating on the carrier allows for an improved level of adhesion with the polymeric or elastomeric material. In Garnier, the coating does **not** comprise such a polymer, but only comprises a **monomer**. These facts are explained in the original specification and are further evidenced by the attached affidavit, submitted herewith pursuant to 37 C.R.F. § 1.132. Under 35 U.S.C. § 102, the reference must teach every aspect of the claimed invention. M.P.E.P. § 706.02(a). Because Garnier does not teach this aspect of the invention claimed in independent Claims 1, 6, 7 and 11, it is believed that these claims are distinguished over the prior art. Because Claims 2-5, 8-10, 12, 15, 18 and 20-21 depend from and have all the limitation claimed in independent Claims 1, 6, 7 and 11, these dependent claims are also believed to be distinguished from Garnier.

The Examiner also rejected claims 1-5, 8-10, 12 and 20-21 under 35 U.S.C. § 102(b) as being anticipated by JP 58-193134 ("JP '134"). JP '134 discloses a steel reinforcement element with a liquid rubber containing -COOH or -OH functional groups and a coating that is achieved by immersion of a steel element in a pure liquid rubber bath. Because of the viscosity of the liquid rubber, it is impossible to achieve the deposition of thin layers. Thus, as stated above, Applicant's invention is distinguishable in that, unlike JP '134, it allows for the deposition of a thin layer which provides for improved adhesion. Moreover, Claims 20 and 21 have been amended to claim a layer of a polymeric or non-cured elastomeric composition **that comprises polymers that cannot be bound directly to the metal surface** on top of said coating for further reinforcement. This provides for a thin coating layer bearing functional groups bonding to the metal surface and an additional layer without these functional groups. The excellent adhesion between these layers during vulcanization allows for improved adhesion that cannot be achieved by a single thick layer of vulcanizable polymeric material coated to a thickness equal to that of the combined layers. The JP '134 liquid rubber does not comprise functional groups covalently

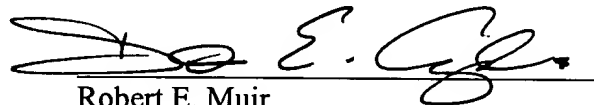
bonded to the metal surface of the reinforcing carrier. These facts are disclosed in the original specification at page 6, lines 4-9 and are further evidenced by the attached affidavit, submitted pursuant to 37 C.F.R. § 1.132.

The Examiner also rejected Claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Garnier et al, in view of the admitted prior art. However, for the reasons stated above, Claim 1 (from which dependent Claim 9 depends) is distinguishable from Garnier and the admitted prior art and is non-obvious in light of Garnier and the cited prior art. Neither Garnier, nor any other prior art references, teach or suggest the deposition of an adhesion promoter from solution, rather than dipping, to allow for thin layers and the resultant improved adhesion therefrom. Therefore, Garnier in view of the prior art does not render Claim 9 obvious. Claim 9 is believed to be in condition for allowance.

The Examiner also rejected Claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Garnier in view of Marzocchi (U.S. Patent No. 3,793,130) or Goliaszewski et al (U.S. Patent No. 5,518,770) or JP '134. Claim depends from Claim 9 and, thus, includes all of the non-obvious limitations described above with respect to Claim 9. Therefore, for the same reasons that Claim 9 is non-obvious in light of Garnier and the other prior art, Claim 10 is likewise non-obvious and is believed to be in condition for allowance.

It is submitted that this application is now in condition for allowance and an early notice of allowance is solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Robert E. Muir", is written over a horizontal line.

Robert E. Muir
Reg. No. 23,017
Dutro E. Campbell, II
Reg. No. 46,239
Husch & Eppenberger, LLC
190 Carondelet Plaza, Suite 600
St. Louis, Missouri 63105-3441
(314)480-1500

Version With Markings to Show Changes Made

In the Claims:

The following is a marked up version of claims 1, 6, 7, 9, 15-19 and 20, with all changes shown by conventional comparison (underlining and bracketing):

1. A coated metal reinforcement element for a polymeric or elastomeric material comprising: a metal reinforcement element having a metal surface; and a coating for the reinforcement element comprising a polymer deposited from a solution comprising a solvent selected from the group consisting of an aqueous solvent, alcoholic solvent [or] and organic solvent and compatible with and co-polymerizable with said material to be reinforced, and bearing functional groups covalently bonded to the metal surface of said reinforcement element.

6. A coated metal reinforcement element for a polymeric or elastomeric material comprising: a metal reinforcement element having a metal surface; and a coating for the reinforcement element comprising a polymer deposited from a solution comprising a solvent selected from the group consisting of an aqueous solvent, alcoholic solvent [or] and organic solvent and compatible with and co-polymerizable with said material to be reinforced, and bearing functional groups covalently bonded with the outward directed first functional groups of a mono-molecular layer of a bifunctional adhesion promoter intercalated between said metal and said coating and bound to said metal by its second functional groups.

7. A coated metal reinforcement element for a polymeric or elastomeric material comprising: a metal reinforcement element having a metal surface; and a coating for the reinforcement element comprising a polymer deposited from a solution comprising a solvent selected from the group consisting of an aqueous solvent, alcoholic solvent [or] and organic solvent and compatible with and co-polymerizable with said material to be reinforced, and bearing functional groups covalently bonded with the outward directed first functional groups of a multi-molecular layer of a bifunctional adhesion promoter intercalated between said metal and said coating and bound to said metal by its second functional groups.

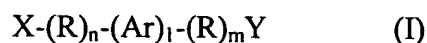
9. A coated metal reinforcement element according to claim 8, wherein said elongated steel element is coated with one or more metallic layers comprising an alloy selected from the group consisting of brass, bronze, zinc, zinc alloy, tin [or] and tin alloy.

15. A coated metal reinforcement element according to claim 12, wherein the elastomeric block copolymer is selected from the group consisting of styrene butadiene rubber, butyl rubber, acrylonitrile butadiene rubber, ethylene propylene dien copolymer, ethylene propylene copolymer, natural rubber, synthetic poly(isoprene), chloroprene rubber, [or] and a functionalized non-cured rubber composition.

16. A coated metal reinforcement element according to claim 15, wherein the non-cured rubber composition is selected from the group consisting of a [synthetic or natural poly(isoprene) or poly(butadiene)] synthetic poly(isoprene), a natural poly(isoprene), a synthetic poly(butadiene), and a natural poly(butadiene) and includes common vulcanization additives and curing materials.

17. A coated metal reinforcement element according to claim 1, wherein the functional group [include] is selected from thiol groups; mercapto groups; silanes; amines; -SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl; -PO₃H₂; -SO₂H; their acid anhydride and their acid chloride groups; organometallic groups of the formula -M(OR')_n or -M(Cl)_n, whereby M is a metal selected from the group consisting of Al, Sn, B, Ti [or] and V, n being the ligand number corresponding to the metal M; phthalocyanine or phthalonitrile groups[,] ; or monothiol or monothiolate groups, wherein R' is alkyl, methyl, ethyl or propyl in case of a bonding directly to the metal surface; all these functional groups either as terminal groups or carried along the polymer backbone or as part of side chains, further including epoxy groups carried along the polymer backbone.

18. A coated metal reinforcement element according to claim 1, further including an adhesion promoter that is a bifunctional compound of the general formula (I)



with X representing a group capable of reacting covalently at the metal surface,

R representing an organic spacer chain,
 Ar representing an aromatic and/or heteroaromatic system,
 Y representing a group capable of forming covalent bonds to a group selected from polymer [or prepolymer] of the coating, and
 $0 \leq n, m \leq 16$; $0 \leq l \leq 6$.

19. A coated metal reinforcement element according to claim 18, wherein the general formula (I) [are] is as follows:

X: -SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl; -PO₃H₂; -SO₂H[,] ; their acid anhydride and their acid chloride groups;

an organometallic group of the formula -M(OR')_n [or] , whereby M is a metal selected from the group consisting of Al, Sn, B, Ti [or] and V, n being the ligand number corresponding to the metal M;

a phthalocyanine or a phthalonitrile group;

a monothiol group or a monothiolate group;

with R' being alkyl, namely methyl, ethyl or propyl;

Y: NH₂; NHR'; NR'₂; or an unsaturated residue, having an unsaturated terminal double or triple carbon-carbon bond; an acrylic or methacrylic acid group and [is] its methyl or ethyl esters;

-CN; an activated carboxylic ester; an aldehyde group; an epoxide group;

-SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl; or a functional group capable of forming a complex with at least one ingredient of a non-metallic medium;

R: -CH₂-; a -(CH₂)_n- chain and whereby $2 \leq n \leq 20$ and whereby said chain may be unhalogenated, partially halogenated or perhalogenated and may contain aromatic or thiophen units, and whereby the chain and/or the units may comprise substituents selected from the group consisting of:

-(CH₂)_iCH₃ with $0 \leq i \leq 5$, -O(CH₂)_jCH₃; -O(CF₂)_jCH₃ with $0 \leq j \leq 4$; -CN; -NH₂; -CF₂-; -CH₂-CO-NH-CH₂-; -CF₂-CO-NH-CF₂-; -CH₂-CO-NH-CF₂-; and CF₂-CO-NH-CH₂- [or $0 \leq n, m \leq 16$,,];

AR: an aromatic and/or heteroaromatic system substituted for the substituents.

20. A coated metal reinforcement element according to claim 1, including a layer of a polymeric or non-cured elastomeric composition on top of said coating for further reinforcement, wherein said layer comprises polymers that could not be directly bound to the metal surface.